CORVALLIS
ENHANCING COMMUNITY LIVABILITY

Chapter Four

ALTERNATIVES

Alternatives

In the previous chapter, airside and landside facilities required to satisfy the demand through the long range planning period were identified. The next step in the planning process is to evaluate reasonable ways these facilities can be provided. There can be numerous combinations of design alternatives, but the alternatives presented here are those with the perceived greatest potential for implementation.

Any development proposed for a master plan is evolved from an analysis of projected needs for a set period of time. Though the needs were determined by utilizing industry accepted statistical methodologies, unforeseen future events could impact the timing of the needs identified. The master planning process attempts to develop a viable concept for meeting the needs caused by projected demands for the next 20 years. However, no plan of action should be developed which may be inconsistent with the future goals and objectives of the City of Corvallis and its citizens, who have a vested interest in the development and operation of the airport.

The development alternatives for Corvallis Municipal Airport can be categorized into two functional areas: the **airside** (runways, navigational aids, taxiways, etc.) and **landside** (hangars, apron, and terminal area). Within each of these areas, specific capabilities and facilities are required or desired. In addition, the utilization of airport property to provide revenue support for the airport and to benefit the economic development and well-being of the region must be considered.

Each functional area interrelates and affects the development potential of the others. Therefore, all areas are examined individually and then coordinated as a whole to ensure the final plan is function-

al, efficient, and cost-effective. The total impact of all these factors on the existing airport must be evaluated to determine if the investment in Corvallis Municipal Airport will meet the needs of the community, both during and beyond the 20-year planning period.

The alternatives considered are compared using environmental, economic, and aviation factors to determine which of the alternatives will best fulfill the local aviation needs. With this information, as well as input from various airport stakeholders, a final airport concept can evolve into a realistic development plan.

AIRPORT DEVELOPMENT OBJECTIVES

Prior to identifying objectives specifically associated with development of Corvallis Municipal Airport, non-development alternatives are briefly considered. Non-development alternatives include a "no-build" or "do-nothing" alternative, the transfer of services to another existing airport, or the development a new airport at a new location.

Corvallis Municipal Airport plays a critical role in the economic development of the region and plays an important role in the continuity of the national aviation network. There is significant public and private investment at the airport. Pursuit of a non-development alternative would slowly devalue these investments, lead to infrastructure deterioration, and potentially the loss of significant levels of federal funding for airport improvements. Ultimately, the safety of aircraft, pilots, and persons on the ground could be jeopardized. Therefore, the non-development alternatives are not further considered.

It is the goal of this effort to produce a balanced airside and an appropriate landside aircraft storage mix to best serve forecast aviation demands. However, before defining and evaluating specific alternatives, airport development objectives should be considered. As owner and operator, the City of Corvallis provides the overall guidance for the operation and development of the airport. It is of primary concern that the airport is marketed, developed, and operated for the betterment of the community and its users. With this in mind, the following development objectives have been defined for this planning effort:

- To preserve and protect public and private investments in existing airport facilities.
- To develop a safe, attractive, and efficient aviation facility in accordance with applicable federal, state, and local regulations.
- To develop a balanced facility that is responsive to the current and long term needs of all general aviation users.
- To be reflective and supportive of the long term planning efforts currently applicable to the region.
- To develop a facility with a focus on self-sufficiency in both operational and developmental cost recovery.
- To ensure that future development is environmentally compatible.

REVIEW OF THE PREVIOUS AIRPORT PLAN

The last master plan was begun in 1999 and final approval was received in 2001. **Exhibit 4A** presents the master plan concept from 2001. On the airside, the previous plan considered the following major elements:

- Extend Runway 17 to the north 750 feet.
- Extend Runway 35 to the south 300 feet.
- Provide an overall runway length of 6,950 feet to accommodate large commercial passenger jets.
- Extend Taxiway B to both new runway ends and create a true parallel taxiway.
- Relocate MALSR and glide slope antenna to maintain CAT I approach to Runway 17.
- Acquire RPZ property that extends beyond airport property.

On the landside, the following major improvements were considered for the master plan:

- Planning for an ATCT to be located east of Runway 17-35 and south of Runway 9-27.
- Removal of the large WWII era hangar.
- Development of a commercial terminal building facing the main apron.
- Designated on-airport land uses including Commercial Aviation Facilities, Limited Aviation Facilities, Aviation Accessible Development, Airport Compatible Development, Airport Development, and Runway/Taxiway.
- Additional hangars to the west of the WWII era hangar, north of the fuel farm.
- New apron and conventional hangars at the northeast end of Taxiway A.
- Numerous new T-hangars and box hangars utilizing the single access taxilane located east of the WWII era hangar and the former HTSI hangars.

A significant focus of the previous master plan was planning for the introduction of commercial passenger service to the airport. This factor impacts many airport design elements. Since commercial passenger service is much less likely in today's aviation environment, significant commercial passenger service is not considered in this planning effort. Nonetheless, there may be some elements of the previous master plan concept that should be retained in this update.

The previous master plan correctly identified the disposition of the large WWII era hangar as critical to all other planning at the airport. The previous plan ultimately recommended removal of the large hangar. This master planning effort will reconsider various alternatives for the large WWII era hangar including removal, closure of one side, or rehabilitation.

The previous plan provided for box hangar construction north of the existing fuel farm. This is an area with ready access to the apron and taxiway system. The same holds true for the planned conventional hangars situated at the eastern end of the airport adjacent to Taxiway A. Both of these are reasonable and may be continued into this planning effort.

The most significant concern regarding the previous planning concept is the planned expansion of the terminal hangar area (north of the WWII era hangar) that continues to funnel all aircraft move-

ments on a single taxilane. Eventually, significant congestion could be realized and aircraft movement efficiency could be severely and negatively impacted. The alternatives of this plan will consider providing adequate taxiway access to support additional hangar construction.

On the airside, the previous plan considered a runway extension of 1,050 feet with 300 feet added to the south end (to preserve the location of the localizer antenna) and 750 feet on the north end. A total runway length of 6,950 feet was planned, primarily to accommodate regular operations by larger commercial passenger aircraft. These assumptions have been revisited and it has been determined that a total runway length of 6,500 feet would accommodate forecast operations. Alternatives for extension of Runway 17-35 will be examined.

New taxiway design standards were recently published by the FAA that will impact the layout of taxiways at Corvallis Municipal Airport. The previous master plan recommended a redesign of Taxiway B to be fully parallel to Runway 17-35. This design element is supported in the new FAA taxiway design standards and will be considered in this planning effort.

The previous master plan successfully guided airport development for more than 10 years. Several assumptions included in that planning effort have changed, most notably the remote possibility of commercial passenger service utilizing large passenger jets. As a result, this master plan will proceed under the assumption that commercial passenger jet operations will not occur in sufficient numbers (500 annually) to be considered the critical design aircraft.

AIRSIDE PLANNING CONSIDERATIONS

Generally, airside issues relate to those airport elements that contribute to the safe and efficient transition of aircraft and passengers from air transportation to the landside facilities at the airport. This includes the established design standard for the airport, the instrument approach capability, the capacity of the airfield, the length and strength of the runways, and the layout of the taxiways. Each of these elements was introduced in the previous chapters. This chapter will examine airside issues specific to Corvallis Municipal Airport. These will then be applied to several airside development alternatives. **Exhibit 4B** presents a summary of the primary airside and landside planning issues to be considered in this alternatives analysis.

As discussed in the Facility Requirements chapter of this master plan, the airport reference code (ARC), as applied to each runway, defines the minimum applicable design standards. Runway 17-35 should be designed to meet the design standards for ARC C-II currently. In the future, Runway 17-35 should be designed to meet ARC D-II standards. Runway 9-27 should be designed to meet standards associated with ARC B-II. The design standards applicable to these ARCs were previously presented in Table 3G.

RUNWAY LENGTH AND WIDTH

Runway 17-35 is currently 5,900 feet long and 150 feet wide. Analysis in Chapter Three - Facility Requirements indicated that the current runway length meets the

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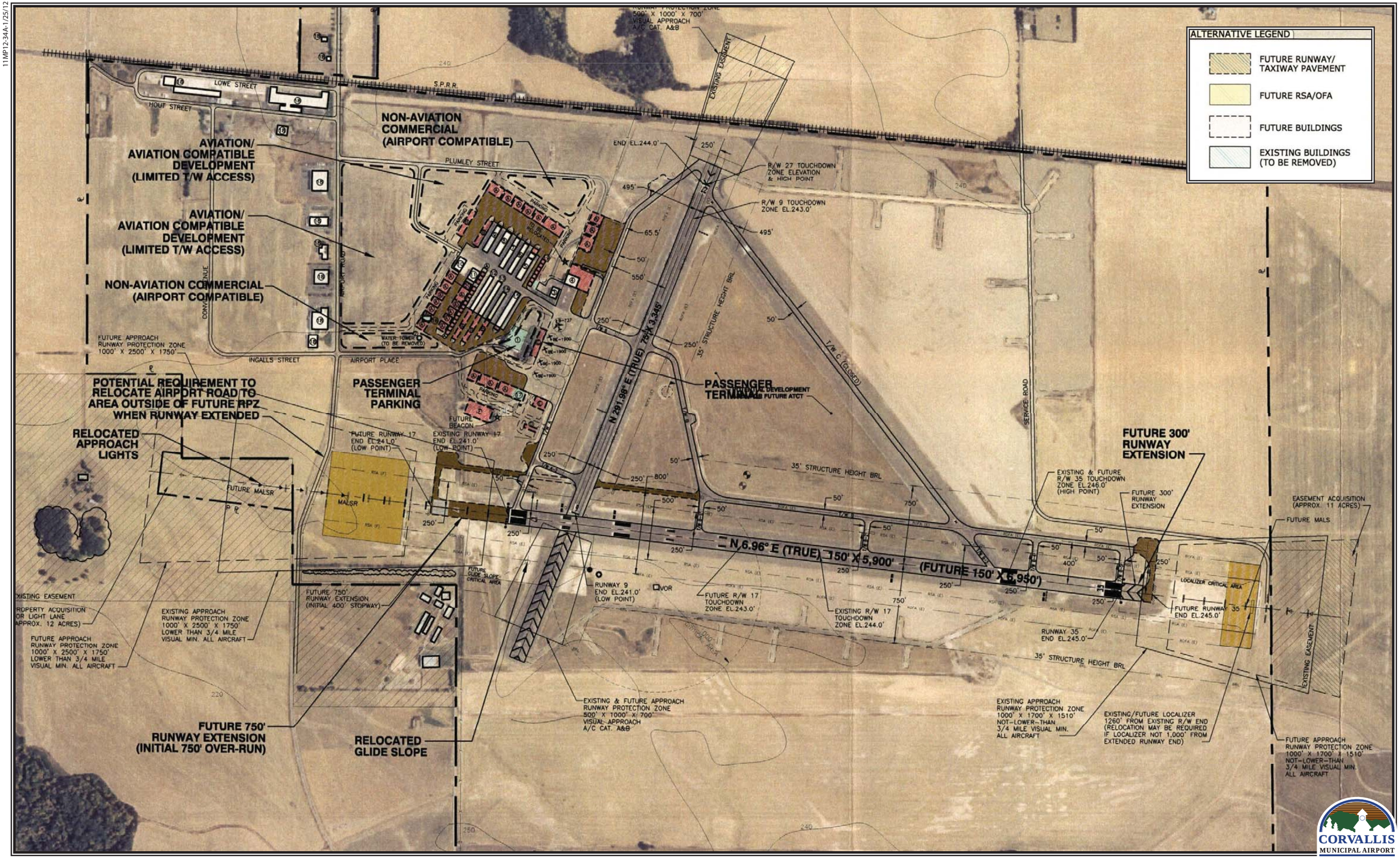

Exhibit 4A
2001 MASTER PLAN

AIRSIDE PLANNING CONSIDERATIONS

- Primary Runway Length: Examine impacts of increasing the length of Runway 17-35 from 5,900 feet to 6,500 feet.
- Crosswind Runway Length: Analyze Runway 9-27 for operational length and determine if there is a continued need for a 200-foot landing displacement to Runway 27.
- Runway 9 Threshold: Examine opportunities for an entrance taxiway to Runway 9 threshold.
- Safety Areas: Maintain adequate Runway Safety Area (RSA), Object Free Area (OFA), Obstacle Free Zone (OFZ), and Runway Protection Zones (RPZ).
- Taxiway Layout: Analyze existing taxiway layout and redesign to meet new FAA design standards.
- Navigational Aids: Preserve the Instrument Landing System (ILS) to Runway 17. Consider an improved instrument approach to Runway 35.

LANDSIDE PLANNING ISSUES

- Separation of Activity Levels: Plan facilities so that similar activity types are grouped together in order to limit the potential interaction of large and small aircraft.
- Facility Layout: Maximize airport property for aviation related development.
- WWII Era Hangar: Examine possible functional uses for this hangar and its potential impact on development and efficient aircraft movement. Options include maintaining the hangar, closing one side of the hangar, or removing the hangar.
- Airport Land Uses: Designate airport land uses for aviation and non-aviation related uses.
- Strategic Land Acquisition: Identify any adjacent lands that should be acquired by the airport for the protection of safe aviation activity.
- Airport Access: Examine potential improvements to the surface transportation system based on each alternative.
- Hangar Area Access: Provide a second taxilane access point to aircraft hangar areas to reduce the potential congestion.
- Long Term Vision: Provide a long term facility layout for the airport that extends beyond the 20-year scope of this master plan in order to preserve the very long term viability of the airport.

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needs of 100 percent of business jets at 60 percent useful load. This is the FAA standard for an airport with 500 or more annual operations by large business jets. If the airport were to receive 500 annual operations by specific large business jets, such as the Lear 60 or Citation X, then a runway length of 6,500 feet may be justified.

The alternatives to follow will examine the feasibility of extending Runway 17-35 by 600 feet. Initial analysis indicates that there is no advantage to splitting the extension between the two ends. In fact, this could increase the cost of such a project. As a result, the alternatives will only consider extension of Runway 17-35 entirely to the north or south.

At 150 feet wide, Runway 17-35 exceeds standard. At the time of the next major rehabilitation or reconstruction of the runway, a cost-benefit should be undertaken to determine if it is financially feasible to narrow the runway. A major runway rehabilitation project is not planned during the 20 year scope of the master plan therefore, the runway is planned to remain at its current width.

Crosswind Runway 9-27 currently measures 3,545 feet in length and 75 feet in width. The minimum runway length needed is 3,100 feet in order to accommodate 95 percent of small aircraft (those weighing less than 12,500 pounds) and 3,600 feet for 100 percent of small aircraft with less than 10 passenger seats. Small aircraft that are more susceptible to crosswinds would have an option to utilize the crosswind runway. The existing runway length and width is adequate for the airport and should be maintained.

The landing threshold to Runway 27 is displaced by 200 feet. This means there is 3,345 feet available for landing to Runway 27. All other operational directions have the full runway length available for use. The purpose of the displaced landing threshold is to provide adequate approach clearance over the railroad tracks located to the east of the runway.

Runway 17-35 is currently 150 feet wide which exceeds the standard of 100 feet. The runway is in excellent condition currently and a major reconstruction is not anticipated in the near future. At the time of the next major reconstruction, the City of Corvallis and the FAA may need to determine if it is economically feasible to maintain the runway at its current width. Alternatives considered here will assume that the runway is maintained at its current width.

Runway 9-27 is 75 feet wide which meets the design standard. Alternatives considered will maintain the width of the crosswind runway.

INSTRUMENT APPROACHES

Instrument approach procedures, as previously described in the Inventory chapter, are critical to extending the usefulness of an airport into times of poor weather. Instrument approaches are particularly important for airports serving business jet operations and at those airports with frequent cloudy conditions, such as Corvallis Municipal Airport.

Runway 17 provides an instrument landing system (ILS) which provides visibility minimums of ½-mile and cloud ceilings of 200 feet, often referred to as CAT-I minimums. There are three elements that make up the ILS, the localizer antenna to provide lateral positioning information, the glide slope antenna to provide hori-

zontal positioning information, and the approach lighting system to provide alignment and visual information. All three of these systems are ground-based and are located at the airport.

The FAA is advancing NextGen air navigation systems which are based on the constellation of global positioning system (GPS) satellites. New instrument approaches such as LPV (Lateral Performance with Vertical Guidance) approaches are providing near CAT-I minimums. In fact, Runway 35 currently has an LPV approach with ¾-mile visibility minimums and 200-foot cloud height ceilings. To obtain an LPV approach with CAT-I minimums, an approach lighting system is required but not the localizer or glide slope antennas. As of 2012, there were 2,771 LPVs at 1,410 airports in the U.S., which is almost three times the number of ILS approaches. The airside alternatives will consider the addition of an approach lighting system to the Runway 35 end with the goal of obtaining CAT-I minimums to this end as well.

An LPV approach with CAT-I minimums will also be considered for Runway 17 since the approach lighting system is already in place. The ground-based ILS to Runway 17 should also be preserved if possible as many pilots still rely on this type of system.

The ILS system could be lost if there is a need to relocate the ground-based equipment. The FAA is not typically installing or relocating ILS equipment since CAT-I GPS approaches are feasible. According to the NextGen Implementation Plan – March 2012, the FAA is considering an incremental program to phase out CAT-I ILS installations by 2025. Any extension of Runway 17 would necessitate the relocation of the glide slope antenna and the approach lighting system. The cost to relocate this equipment is nearly the same as the cost to purchase and install new equipment; therefore, the airport could lose its ILS if an extension is planned to the north and they fail to meet eligibility criteria.

There is not currently a straight-in instrument approach to either end of Runway 9-27. For this runway to serve as an adequate back-up to the primary runway, straight-in approaches with a 1-mile visibility minimum are recommended. Due to the lack of operations on Runway 9, estimated at only one percent annually, an instrument approach will only be considered for Runway 27.

RUNWAY SAFETY AREAS

The runways at Corvallis Municipal Airport currently meet design standards for the runway safety area (RSA), object free area (OFA), and the obstacle free zone (OFZ). These imaginary surfaces surrounding the runways are an integral part of the runway itself. Any planned improvements to the runway must also meet the design standards associated with these safety area surfaces.

The RSA, OFA, and OFZ as they extend beyond the Runway 9 end cross the safety areas of the primary runway. While this circumstance is not a violation of design standards, there may be some opportunities to increase the margin of safety by separating (decoupling) these two runways to the maximum extent practicable. One example where a problem could conceivably develop is if a small aircraft were landing on Runway 27 while a larger business jet, which is less susceptible to crosswinds, was landing on Runway 35; these two aircraft could conceivably meet

in the safety areas. The alternatives for Runway 9-27 will consider potential alterations to the Runway 9 threshold that would limit the potential for incursion into the Runway 17-35 RSA, while maintaining adequate runway length for Runway 9-27.

In addition, there is no threshold taxiway access to Runway 9, necessitating a back-taxiing maneuver by a departing aircraft needing the full runway length. Operationally, the back taxiing maneuver is rare since Taxiway B enters Runway 9-27 only 280 feet from the Runway 9 threshold. Nonetheless, alternatives will consider the potential for a threshold taxiway entrance to Runway 9.

RUNWAY PROTECTION ZONES

The disposition of each of the RPZs should be considered individually. For runways with a displaced landing threshold, separate approach and departure RPZs must be considered. The FAA recommends that the airport have ownership of the RPZ lands where feasible. If outright ownership is not feasible, then easements are also acceptable. Easements in the RPZ should allow the airport to positively limit the heights of structures. A third option for protection of the RPZs that extend beyond airport property is implementation of strict land use zoning that, at a minimum, prohibits residential development or other development that could serve as a congregating point for people, and restricts structure heights.

The RPZ serving Runway 35 extends south beyond airport property. This area encompasses approximately 14.5 acres. The airport owns an easement of approximately 13.5 acres covering most of this RPZ property. In the short term, the airport should acquire this property or acquire the remaining one acre in easement.

Approximately 18.8 acres of land contained within the RPZ leading to Runway 17 extends beyond airport property. The entirety of this area falls within an airport owned easement. The FAA recommends that the airport acquire the entirety of the RPZ if feasible.

Runway 27 has a displaced landing threshold which necessitates both an approach and departure RPZ. The approach RPZ begins 200 feet from the landing threshold, while the departure RPZ begins 200 feet from the runway pavement end. The approach RPZ beyond airport property encompasses 8.5 acres. The departure RPZ encompasses 11.1 acres beyond airport property. The airport owns an easement that encompasses the departure RPZ. There is approximately 0.5 acres of property contained within the approach RPZ that is not covered by an easement.

Each of the airfield alternatives may impact the RPZ lands to some degree. Once a recommended airfield layout is determined, all RPZ property extending beyond airport property will be recommended for acquisition with the understanding that easements or strict land use controls are also acceptable.

NAVIGATION AIDS

Certain approach aids provide information to pilots to indicate if they are on the correct glide path to the runway for landing. A precision approach path indicator (PAPI) light system is available for approaches to Runway 27. This system is particularly important if a straight-in instrument approach is offered to this run-

way end as planned. The PAPI system for Runway 27 will be maintained.

A visual approach slope indicator (VASI) light system is available for both ends of Runway 17-35. The more advanced PAPI system is commonly installed at runways with business jet activity. The alternatives will consider replacing the VASIs with PAPIs for both ends of Runway 17-35. The specific location of the PAPI will be determined by the final location of the landing threshold.

As mentioned previously, planning will consider an improved CAT-I approach to Runway 35. This will require the installation of a medium intensity approach lighting system with runway alignment indicator lights (MALSR). All alternatives for Runway 17-35 will consider the addition of this approach lighting system.

TAXIWAYS

The taxiway system at Corvallis Municipal Airport generally provides for the efficient movement of aircraft to and from the runways. FAA AC 150/5300-13, *Airport Design*, Change 17, instituted new design standards for taxiways, some of which impact planning for Corvallis Municipal Airport.

The new standard is to provide right-angle entrance and exit points from the runway system, especially at the thresholds. The threshold taxiways leading to Runways 17, 9 and 27, do not meet this standard. The purpose of this design standard is to increase pilot situational awareness through design that allows full peripheral pilot viewing. The alternatives to follow will address the application of the new taxiway design standards to the airport.

A full service general aviation airport, such as Corvallis Municipal Airport, with more than 100 based aircraft, should have a full complement of taxiway edge lighting. All alternatives and the capital improvement program will include new edge lighting for Taxiways A and C where there are currently only reflectors.

AIRSIDE DEVELOPMENT ALTERNATIVE I

RUNWAY 17-35

Airside Alternative I, as presented on **Exhibit 4C**, considers a 600-foot extension of Runway 17-35 to the south. This extension would bring the total runway length to 6,500 feet which would meet the potential needs of several large business jets. Taxiway B would also be extended to the new Runway 35 threshold and a hold apron is planned at the south end of Taxiway B.

The localizer antenna is currently situated 1,290 feet from the end of Runway 35. This meets design standard as it is outside of the RSA. When extending the runway, the localizer antenna, which is not considered fixed by function, would need to be relocated 310 feet to the south. This would situate the localizer 1,000 feet from the new runway end, placing it outside the RSA to meet standard.

The RPZ would shift to the south in conjunction with the runway extension. This alternative also considers an improved instrument approach to CAT-I minimums. To qualify for the improved approach, a MALSR is planned. The CAT-I RPZ would encompass approximately 62.2 acres beyond airport property. Approximately 12.7 acres of the new RPZ are currently under an airport easement. While it is

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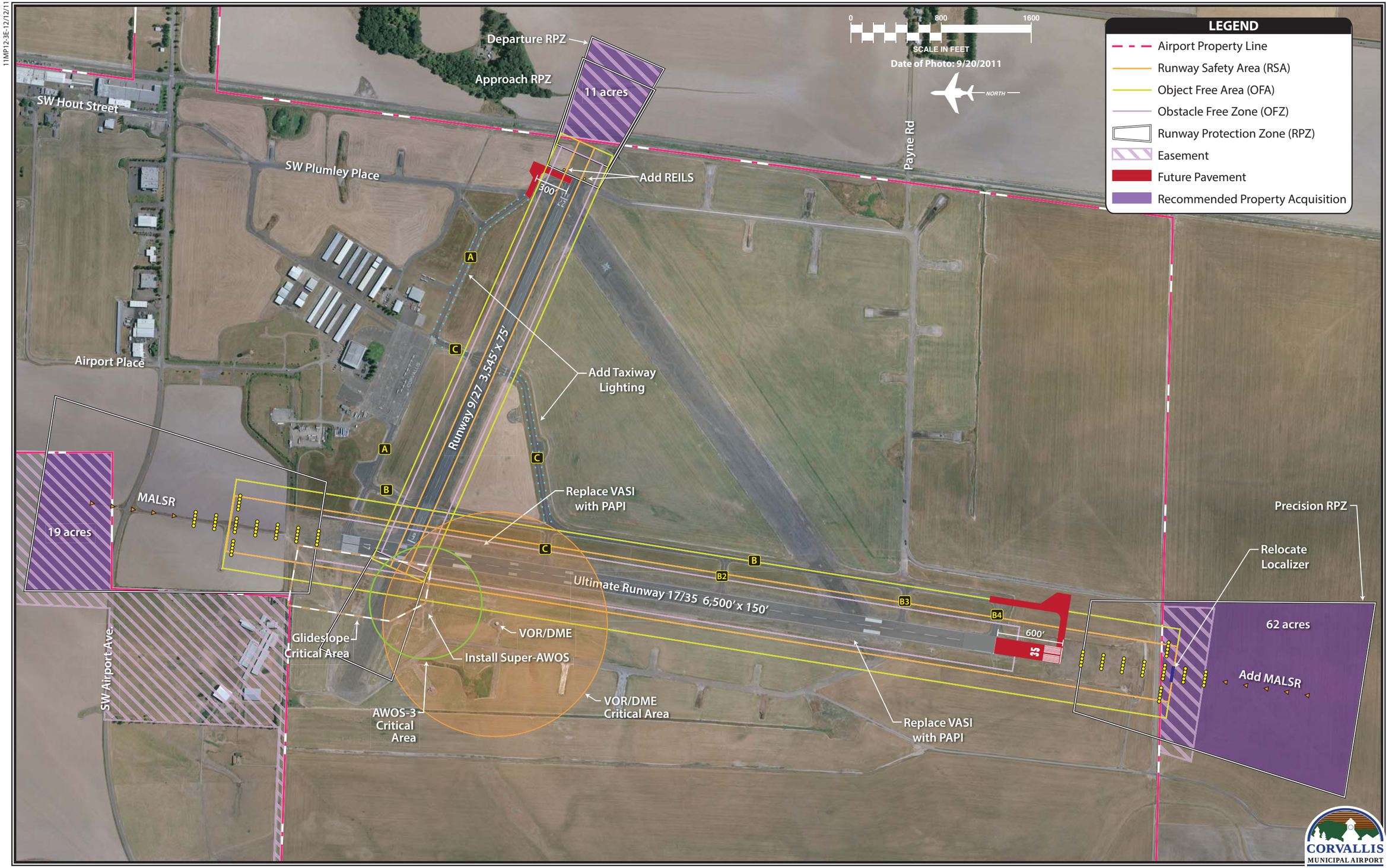

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Exhibit 4C
AIRSIDE ALTERNATIVE 1

recommended that the airport acquire the entire RPZ that would extend beyond airport property, obtaining an easement covering the remaining 49.5 acres not currently under easement is acceptable.

The extension of the runway 600 feet to the south will also extend the RSA and OFA beyond airport property. The airport must own this land as well as the localizer critical area, a total of 4.8 acres.

The existing Runway 17 end would remain in its current position. Approximately 18.8 acres of the RPZ currently extends beyond the airport property boundary on the north end. While it is recommended that the airport own all of the RPZ land, this area is contained within a larger 172-acre easement north of the airport.

RUNWAY 9-27

Runway 9-27 was, at one time, at least 5,000 feet long, extending an additional 1,455 feet to the west. It has been shortened at least twice, once to a length of 3,769 feet, and then again to its current length of 3,545 feet. The most recent adjustment to length occurred around 1998. The existing length was shown to be adequate to accommodate those aircraft that may desire to utilize the crosswind runway when wind conditions dictate.

The FAA was consulted to determine if there were any design or safety issues that needed to be addressed since the safety areas of both runways cross behind the Runway 9 threshold. Following guidance in FAA AC 150/5300-13, *Airport Design*, the current layout is acceptable. In this airfield alternative, Runway 9 is planned to remain in its current configuration.

TAXIWAYS

As introduced previously, FAA design standards for taxiways have recently changed. One area of focus is on parallel taxiways, which should be uniformly parallel for the length of the runway. The new taxiway design standards also indicate that "all new entrance taxiways must be perpendicular to the runway centerline and all existing entrance taxiways should be reconfigured to be perpendicular to the runway centerline."

At Corvallis Municipal Airport, Taxiway B is situated 400 feet from Runway 17-35, centerline to centerline except for that portion of Taxiway B extending from Taxiway A to the intersection with Runway 9-27. This portion of Taxiway B veers to the east until it intersects at a right angle to Taxiway A.

Taxiway A is at a slight angle where it provides access to the Runway 17 threshold. It would be preferable to redesign the taxiway so that it is perpendicular to the runway. This would also entail extending Taxiway B, parallel to the runway, to the intersection with Taxiway A. This design presents an operational challenge as Taxiway A, which is the parallel taxiway serving Runway 9-27, would intersect with Taxiway B at an angle near the end of the newly redesigned Taxiway B. This redesign may cause more pilot confusion than the existing layout; therefore, the existing layout for the Runway 17 threshold entrance taxiway is preserved for this alternative.

At Corvallis, the entrance taxiways to the Runway 27 threshold and the Runway 17 threshold are not perpendicular. In this alternative, the easternmost portion of Taxiway A is extended parallel to Runway 9-27; it then accesses the Runway 27

threshold at the desired right angle. The small portion of Taxiway A that is parallel to the runway is separated at 300 feet from the runway.

AIRSIDE DEVELOPMENT ALTERNATIVE II

RUNWAY 17-35

Airside Development Alternative II, as shown on **Exhibit 4D**, considers placing the long term 600-foot extension of Runway 17-35 on the north end of the runway. Taxiway B would be extended parallel to the runway from its intersection with Runway 9-27 to the Runway 17 threshold. As mentioned previously, the ILS equipment (glideslope antenna and MALSR lights) would have to be relocated, if it is to be retained. A more likely result is that the ILS approach would be replaced with a CAT-I GPS approach.

The RPZ serving Runway 17 would shift to the north, thereby extending further beyond airport property encompassing approximately 34.3 acres. This property would be recommended for acquisition, but it does fall within the airport owned easement in this area. No new incompatibilities would be introduced into the RPZ as the area is used exclusively as farmland.

RUNWAY 9-27

The RSA, OFA, and OFZ to the west of the Runway 9 threshold, extend into the Runway 17-35 environment. While this layout technically meets the FAA design requirements, under certain circumstances the potential for an incursion into the Runway 17-35 RSA exists. For example, a pilot who back-taxis to the Runway 9 threshold in preparation for take-off would be in the Runway 17-35 RSA. If another aircraft were on approach to Runway 17-35, then an incursion would occur. Where feasible, it is desired to design runways and taxiways to prevent potential incursions. It should be noted that Taxiway B is only 280 feet from the Runway 9 threshold; therefore, back-taxiing is very rare, as most pilots will simply begin their takeoff run on Runway 9 at the intersection with Taxiway B.

Another consideration is the fact that there is no direct taxiway access to the Runway 9 threshold. As stated, pilots must back-taxi on Runway 9 in order to utilize the full runway length for takeoff.

One solution to be considered is to relocate the Runway 9 threshold 280 feet to the east to co-locate Taxiway B with the Runway 9 threshold. This location would create a right-angled entrance from Taxiway B. The potential need for back-taxiing on Runway 9 would be eliminated and the potential for an incursion into the Runway 17-35 RSA would be reduced. The total runway length would be 3,265 feet, which would still slightly exceed the minimum requirement of 3,100 feet.

Consideration was given to the potential to extend Runway 9-27 to the west. Theoretically, extending Runway 9 to the west would allow for a threshold taxiway entrance and would reduce the potential for an inadvertent runway incursion by an aircraft preparing for takeoff on Runway 9. Extending the runway presents several challenges.

First, the glide slope antenna would have to be relocated so that the associated critical area would remain clear of passing aircraft on an extended Runway 9-27. If Runway 17-35 were extended to the

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Exhibit 4D
AIRSIDE ALTERNATIVE 2

north, the glide slope antenna could be moved north to maintain the ILS approach to Runway 17. This would also relocate the glide slope critical area to the north. A more likely scenario is that the glide slope antenna would be removed and a CAT-I GPS approach implemented, which does not require the glide slope antenna.

Second, and more critical, is the need to maintain clear the VOR/DME critical area, which has a 1,000-foot radius. If the VOR/DME, situated to the west of Runway 17-35, were relocated approximately 200 feet to the south, then the critical area would not cross an extended Runway 9-27. A project to relocate the VOR/DME in order to allow an extension of Runway 9-27 to the west could only be justified if there is a need for the runway to be longer. Previous analysis indicated that a minimum runway length of 3,100 feet is what is needed to provide pilots of small aircraft with a crosswind runway when wind conditions dictate. Therefore, due to the potential cost of relocating navigational aids and the fact that there is not a need for Runway 9-27 to be longer, an extension of Runway 9-27 is not considered.

The Runway 27 end is planned to remain in its current condition. Adequate RSA, OFA, and OFZ are available beyond the runway end. The landing threshold is displaced 200 feet to allow proper clearance over the railroad tracks.

TAXIWAYS

In the previous alternative, it was recommended to maintain Taxiway B on its current alignment as straightening that portion between Taxiway A and Runway 9-27 could create greater pilot confusion. In this alternative, with the 600-foot extension of Runway 17-35 to the north, it is more prudent to straighten Taxiway B as Taxiway A would no longer serve as the threshold taxiway to Runway 17. It should be noted that reconstruction of this portion of Taxiway B is likely a very low priority for FAA funding and should be considered only at a time when a major reconstruction of Taxiway B is planned.

The entrance of Taxiway A to the Runway 27 threshold is at an angle. New FAA design standards direct planners to redesign this type of entrance taxiway to be a right-angle where possible. As a result, Taxiway A nearest the Runway 27 threshold is redesigned to turn parallel to the runway, and then enter the runway threshold at a right angle.

LANDSIDE PLANNING CONSIDERATIONS

Generally, landside issues relate to those airport facilities necessary, or desired, for the safe and efficient parking and storage of aircraft, movement of passengers and pilots to and from aircraft, airport land use, and overall revenue support functions. In addition, elements such as fueling capability, availability of services, and emergency response are also considered in the landside functions.

Landside planning issues, summarized on **Exhibit 4B**, will focus on facility locating strategies following a philosophy of separating activity levels. To maximize airport efficiency, it is important to locate facilities intended to serve similar functions close together. For example, it makes sense to plan T-hangar structures in a designated area rather than haphazardly building them as needed on the next available spot at the airport. It is also im-

portant to plan for facilities that airport users desire and to group those facilities together, whether they are T-hangars, box hangars, or larger conventional hangars.

The orderly development of the airport terminal area (those areas parallel to the runway and along the flightline) can be the most critical, and probably the most difficult development to control on the airport. A development approach of "taking the path of least resistance" can have a significant effect on the long term viability of an airport. Allowing development without regard to a functional plan can result in a haphazard array of buildings and small ramp areas, which will eventually preclude the most efficient use of valuable space along the flightline.

Activity in the terminal area should be divided into three categories at an airport. The high-activity area should be planned and developed as the area providing aviation services on the airport. An example of a high-activity area is the aircraft parking apron, which provides outside storage and circulation of aircraft. In addition, large conventional hangars housing fixed base operators (FBOs), other airport businesses, or used for bulk aircraft storage would be considered high-activity uses. A conventional hangar structure in the high-activity area should be a minimum of 6,400 square feet (80 feet by 80 feet). If space is available, it is more common to plan these hangars for up to 200 feet by 200 feet. The best location for high-activity areas is along the flightline near midfield, for ease of access to all areas of the airfield.

The medium-activity category defines the next level of airport use and primarily includes corporate aircraft operators that may desire their own box or conventional hangar storage on the airport. A hangar in the medium-activity use area should be at least 50 feet by 50 feet, or a minimum of 2,500 square feet. The best location for medium-activity use is off the immediate flightline, but still with ready access to the runway/taxiway system. Typically, these areas will be adjacent to the high-activity areas. Parking and utilities such as water and sewer should also be provided in this area.

The low-activity use category defines the area for storage of smaller single and twin-engine aircraft. Low-activity users are personal or small business aircraft owners who prefer individual space in T-hangars or small box hangars. Low-activity areas should be located in less-conspicuous areas or to the ends of the flightline. This use category will require electricity, but may not require water or sewer utilities.

In addition to the functional compatibility of the terminal area, the proposed development concept should provide a first-class appearance for Corvallis Municipal Airport. Consideration to aesthetics should be given high priority in all public areas, as the airport can many times serve as the first impression a visitor may have of the community.

Corvallis Municipal Airport is a converted military airfield. These airports are known to have been developed following a path of least resistance strategy, primarily because of the urgency of the military mission. Nonetheless, many facilities at the airport are situated in a logical manner. For example, the large WWII era hangar is centrally located on the main terminal area apron. This hangar currently houses the airport FBO. Aircraft storage hangars are located away from the flightline leaving developable property for higher activity uses closer to the runway system.

As additional development has occurred at the airport, existing taxilanes and other surface infrastructure has been maintained and built around. For example, the taxilane leading from the main terminal apron to the hangar development area is the only taxilane entrance to this area. The first row of hangars is box hangars, which is an appropriate location for medium intensity aircraft storage. The next several rows are T-hangars followed by larger stand-alone box hangars. Ideally, the stand-alone box hangars would be located more to the front of the development area.

Ideally, terminal area facilities at general aviation airports should follow a linear configuration parallel to the primary runway. The linear configuration allows for maximizing available space, while providing ease of access to terminal facilities from the airfield. At Corvallis Municipal Airport, the hangars are situated at an angle to the runway, primarily because the original taxilane entered the hangar development area at an angle.

Each landside alternative will address development issues, such as the separation of activity levels and efficiency of layout. Each of the landside alternatives will plan for adequate facilities to meet the forecast needs from the previous chapter of this plan.

VEHICULAR ACCESS AND PARKING

A planning consideration for any airport master plan is the segregation of vehicles and aircraft operational areas. This is both a safety and security consideration for the airport. Aircraft safety is reduced and accident potential increased when vehicles and aircraft share the same pavement surfaces. Vehicles contribute to the accumulation of debris on aircraft operational surfaces, which increases the potential for foreign object debris (FOD) damage, especially for turbine-powered aircraft. The potential for runway incursions is increased, as vehicles may inadvertently access active runway or taxiway areas if they become disoriented once on the aircraft operational area (AOA). Airfield security may be compromised as there is loss of control over the vehicles as they enter the secure AOA. The greatest concern is for public vehicles, such as delivery vehicles and visitors, which may not fully understand the operational characteristics of aircraft and the markings in place to control vehicle access. The best solution is to provide dedicated vehicle access roads to each landside facility that is separated from the aircraft operational areas with security fencing.

The segregation of vehicle and aircraft operational areas is supported by FAA guidance established in June 2002 and amended in March 2008. FAA AC 150/5210-20, *Ground Vehicle Operations on Airports*, states, "The control of vehicular activity on the airside of an airport is of the highest importance." The AC further states, "An airport operator should limit vehicle operations on the movement areas of the airport to only those vehicles necessary to support the operational activity of the airport."

At Corvallis Municipal Airport, visitors to the airport must cross an active taxilane to access the primary visitor parking lot immediately south of the FBO offices. This taxilane is the entrance to the west side of the large WWII era hangar. The potential for conflict is apparent only when the hangar doors are open and when aircraft are actively taxiing (or being tugged) in or out. At the time, employees of the FBO or airport staff are available to ensure the safe transit of the aircraft. Nonetheless, since a public road

does cross an active taxilane, the alternatives will address potential solutions.

The landside alternatives for Corvallis Municipal Airport have been developed to reduce the need for vehicles to cross apron or taxiway areas. Dedicated vehicle parking areas, which are outside the airport fence line, are considered for all potential hangars.

BUILDING RESTRICTION LINE

The building restriction line (BRL) identifies suitable building area locations on the airport. The BRL encompasses the RPZs, the OFA, the runway visibility zone, NAVAID critical areas, areas required for terminal instrument procedures, and other areas necessary for meeting airport line-of-sight criteria.

Two primary factors contribute to the determination of the BRL: type of runway (utility or other-than-utility) and the capability of the instrument approaches. Runway 17-35 is an "other-than-utility" runway with a precision instrument approach. Runway 9-27 is an "other-than-utility" runway with visual approaches.

The BRL is the product of F.A.R. Part 77 transitional surface clearance requirements. These requirements stipulate that no object be located in the primary surface, defined as being no closer than 250 feet from a visual runway and not closer than 500 feet to a runway served by a non-precision or precision instrument approach. From the primary surface, the transitional surface extends outward at a slope of one vertical foot to every seven horizontal feet. Traditionally, the BRL is set at a point where the transitional surface is 35 feet above runway elevation. For Runway 17-35, the 35-foot BRL is set at 745 feet from the runway centerline. For Runway 9-27, the 35-foot BRL is set at 495 feet from the runway centerline.

At Corvallis Municipal Airport, all structures are clear of the BRL. Future facility planning will maintain this standard.

TERMINAL BUILDING

The airport does not have a dedicated terminal building for general aviation users as space is provided for this function by the airport FBO on the south side of the large WWII era hangar. While this arrangement is not unusual for general aviation airports, many airport sponsors make investments in terminal facilities in order to provide a greater level of service for airport customers and to advance a positive first impression on airport visitors.

This landside alternatives discussion will consider appropriate locations for a dedicated airport terminal building. The preferred location for a new terminal building would be on the flightline, central to airport activity, and convenient for both arrivals and departures.

WWII ERA HANGAR

The WWII era hangar can be a tremendous asset for the airport. It is historically and architecturally interesting, and it is functional as it is leasable space for the airport. It is also a potential liability for several reasons including:

- The cost to maintain such a large and aged structure.
- The location of the public offices and parking on the apron side of the building.

- The dual taxilane access points which requires public vehicles to cross a taxilane.

The landside alternatives will consider three options for this hangar including maintaining it with both entry doors, closing one of the doors, and redeveloping the space (i.e., removal).

LANDSIDE LAYOUT ALTERNATIVES

As presented in Chapter Three – Facility Requirements, additional aircraft hangar storage area is recommended to accommodate forecast growth in based aircraft. An additional 34,800 square feet of space is recommended for T-hangars. Box hangar space appears adequate through the intermediate term with a forecast need for 2,500 square feet in the long term. An additional 46,100 square feet of space is forecast to be needed for conventional hangar space. In total, 83,400 square feet of additional hangar space is needed to accommodate forecast aircraft storage needs at the airport. An additional 14,200 square feet of space is forecast to be needed for non-storage hangar activities such as maintenance or office space.

It should be noted that individual preference should be the final arbiter as to what types of hangars are desired. For example, if the airport has a 10-person wait list for a T-hangar space, then it is a good time to plan for more T-hangars. Likewise, if an individual desires to construct a box hangar, then that becomes the priority. The overall hangar space estimates can and should be adjusted by airport management to reflect actual demand at the airport.

The number of potential landside alternatives can be infinite. The following four alternatives are those that best meet design standards, while maximizing the efficiency of aircraft storage and movement. The landside element of the recommended master plan concept, to be presented in the next chapter, may be one of these three alternatives or, more likely, is a combination of elements from each of them. Input from the planning advisory committee (PAC) is integral to determining the landside vision for the airport.

LANDSIDE ALTERNATIVE A

The basic concept for Landside Alternative A, presented on **Exhibit 4E**, was developed by a sub-committee of the local master plan PAC, meeting informally. This group received some basic guidelines from the consultant and dedicated time and effort, outside of the master planning process, to develop this alternative. The consultant then applied various FAA design standards, particularly separation distances, to insure the concept, at a minimum, meets FAA design criteria.

This design concept presented is an effort to utilize existing pavements and access roads. With tight city budgets, it is important to the PAC to have a vision for the airport that takes advantage of any existing assets.

On the west side of the main apron is located a ramp area intended for use by air cargo operators. The city has submitted an application for a grant to construct this apron. Adjacent to the apron is a planned package sort facility.

To the north of the fuel farm is a planned row of box hangars that would face a new taxilane, which provides access to the de-

velopment area to the north of the WWII era hangar. The taxilane, as shown, would angle slightly to the east in order to allow the existing airport entrance road to be maintained. The taxilane then continues to the northeast terminating near the decommissioned water tower. Several rows of nested T-hangars extend from the existing T-hangars and would access the new taxilane. At the north end of the new taxilane, the existing box hangar layout is filled in with planned box hangars.

The existing taxilane that provides access to the hangar area is planned to be converted to a new airport entrance road and to provide dedicated parking. This road would extend to the main terminal area. New public parking is then planned in the terminal area providing access to the conventional hangars and business located nearest the main apron. A new conventional hangar fronting the main apron is planned. The east side of the WWII era hangar would be converted from its primary use as a taxilane to public parking. The existing public parking would also connect to this new parking lot.

There is one box hangar that opens toward the current access taxilane. To maintain the usefulness of this hangar, the door is planned to be relocated to the north side of the hangar. (the southside of the hangar has a telephone pole that would interfere with operations of the hangar door.)

In this alternative, the east side of the WWII era hangar would remain functional for rare occasions when it may be necessary to ferry aircraft from the hangar to the ramp. In this case, the parking lot would have to be cleared of cars. Fencing and gating would have to be implemented in order to maintain the security of the high-activity terminal area ramp.

East of Taxiway C, an area is identified for large conventional hangars. These hangars would front a new aircraft apron. A new taxilane is planned to extend to the north, on the west side of the new conventional hangars. This taxilane would run parallel to the existing access taxilane and would provide for additional hangar development to the east.

Immediately to the north of the row of conventional hangars is a public parking lot accessible from W. Plumley Street. To the north of the parking lot is a taxilane fronting a row of box hangars. Farther to the north are several rows of T-hangars. At the end of the taxilane are two sets of connected box hangars, one to either side of the taxilane.

LANDSIDE ALTERNATIVE B

Landside Alternative B, as shown on **Exhibit 4F**, is a variation of Landside Alternative A. There are three primary differences. The first is the extension of a taxilane to the northeast on the west side of the WWII era hangar. In this alternative, the point where the taxilane begins from the apron has been shifted approximately 50 feet to the east. This shift allows for the taxilane to be straight, rather than having a jog in it. By eliminating the jog, line-of-sight along the taxilane can be maintained. With the potential quantity of aircraft accessing this taxilane, the shift will increase the efficiency of aircraft movements. It becomes less likely that an aircraft leaving the hangar area and an aircraft entering the area will converge on the taxilane. The shift also preserves the entrance road. This is desirable in order to maximize existing surface infrastructure and reduce overall development costs.

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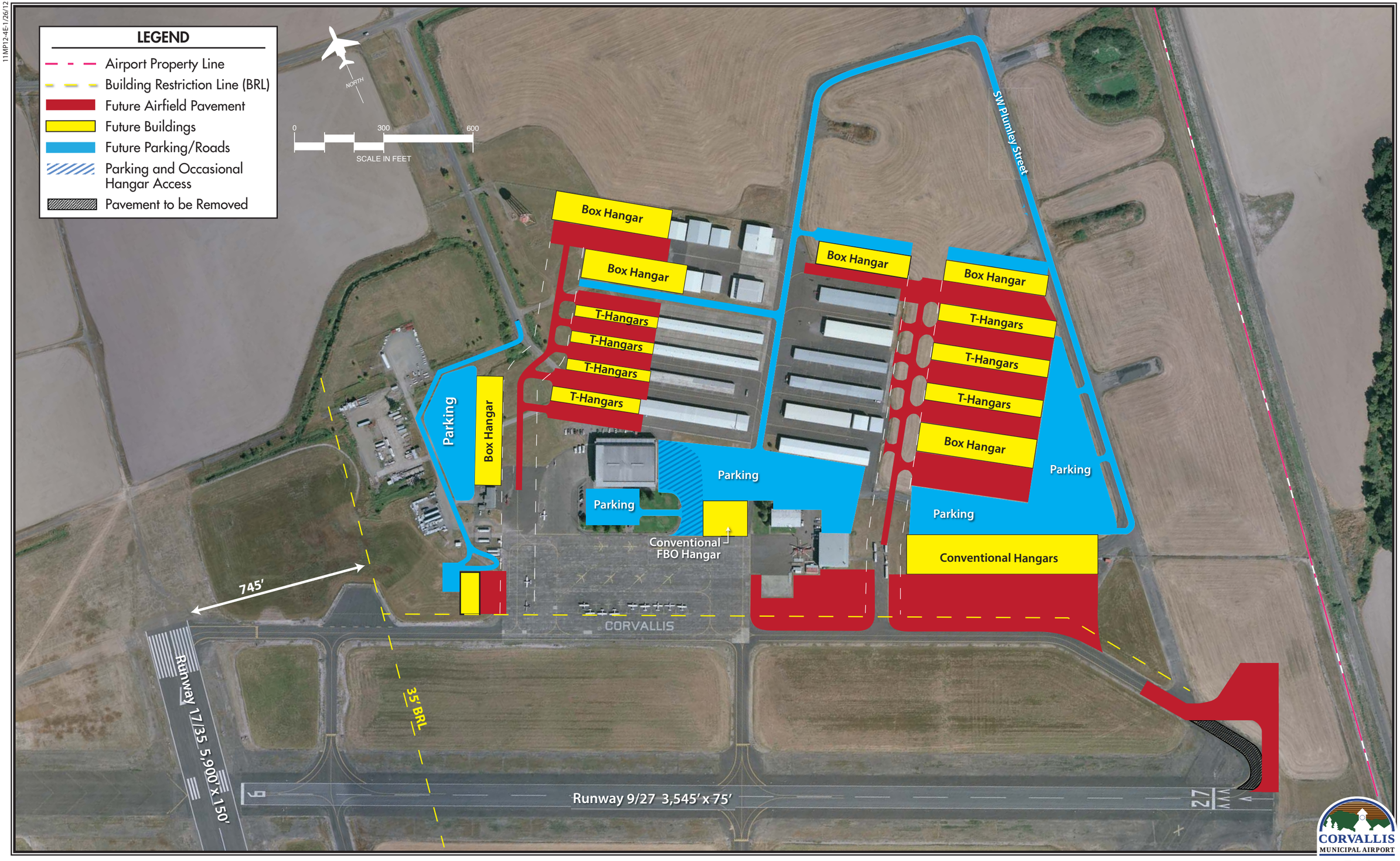

CORVALLIS MUNICIPAL AIRPORT

Exhibit 4E
LANDSIDE ALTERNATIVE A

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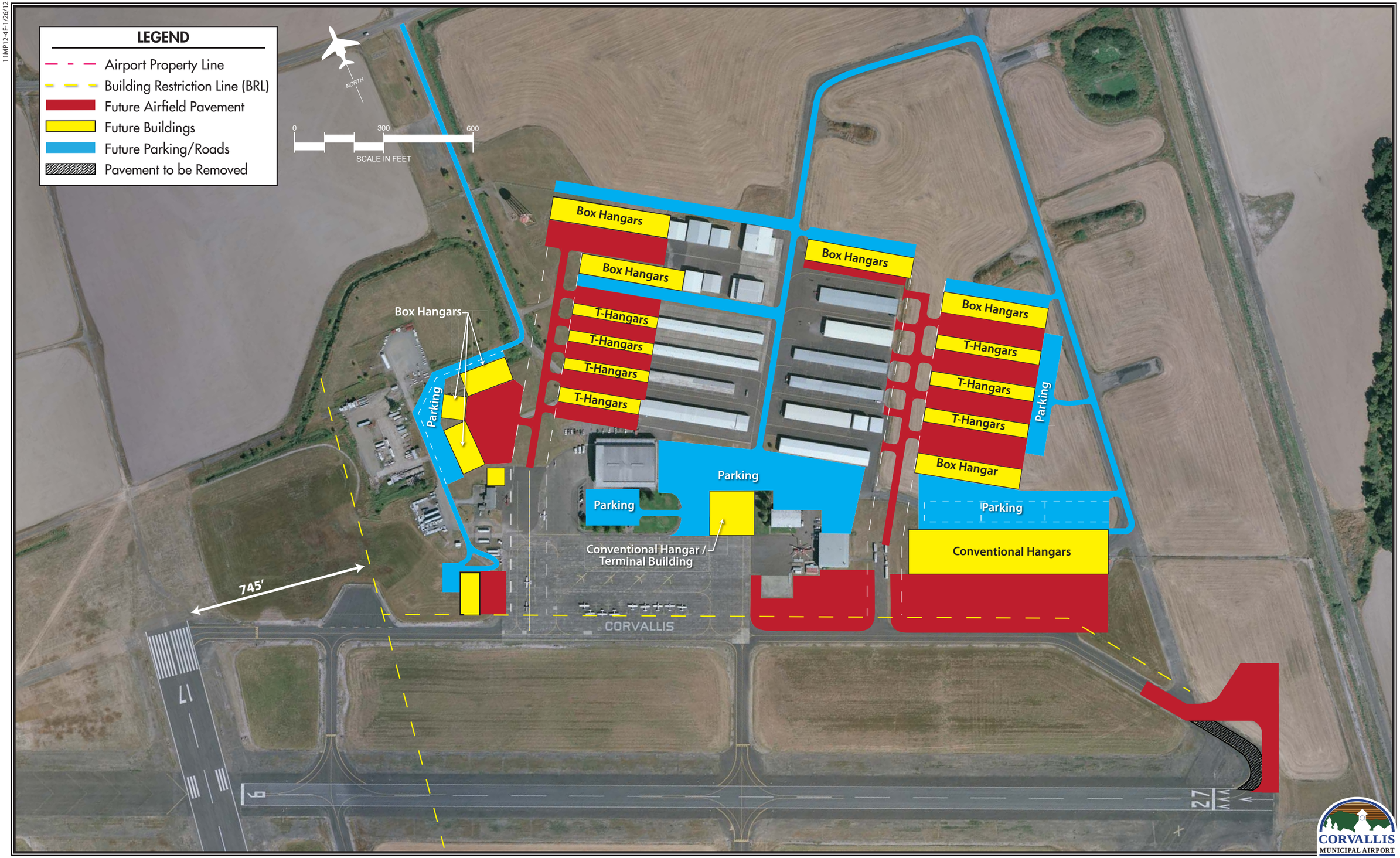

CORVALLIS MUNICIPAL AIRPORT

Exhibit 4F
LANDSIDE ALTERNATIVE B

Finally, the shift of the taxilane provides a greater clearance on the apron in the area currently leased by the air ambulance operator. Currently, the helicopter is parked on the apron immediately adjacent to their offices. The rotor of the helicopter is typically 15-20 feet from the current marked taxilane centerline. By shifting the taxilane to the east, the helicopter rotor would be at least 40 feet from the centerline. This distance would meet the separation standard for aircraft in airplane design group I (ADG with wingspans less than 49 feet). To meet the taxilane object free area for ADG II, the separation should be 57.5 feet.

It should be noted that the air ambulance operators are planning to construct a hangar immediately north of their existing offices. If the helicopter is regularly stored in the hangar, then it would be outside of the taxilane object free area.

The next difference is the row of box hangars planned immediately north of the air ambulance office/hangar. In Landside Alternative A, the doors of these hangars would be adjacent to the taxilane object free area. This means that when aircraft owners tug their aircraft out of the hangar, they would be blocking the taxilane. Landside Alternative B presents a different layout that places these box hangars around a central apron area. With this configuration, one or more aircraft could be on the apron without blocking the taxilane. This configuration also allows for an additional hangar to be located in the area.

The last significant difference is on the planned east side of the development area. A vehicle parking lot is planned on the back side of a row of conventional hangars. In Landside Alternative A, immediately north of this parking lot is a taxilane to serve a row of box hangars. In this alternative, the box hangars are situated so that the parking lot can be utilized to access these hangars as well. The row of box hangars would then have aircraft doors facing north to a taxilane.

LANDSIDE ALTERNATIVE C

Landside Alternative C, as shown on **Exhibit 4G**, is developed based on the assumption that the WWII era hangar would be removed. This area is then redeveloped to include a general aviation terminal building and two large conventional hangars. These three structures would face the main terminal area apron.

A new airport entrance road is considered that would provide access to the terminal building. Vehicle parking would be available along the airport entrance road to serve both the existing hangars on the east and planned new box hangars on the west.

A taxilane is planned to be extended north on the west side of the terminal area. On the west side of the taxilane, two rows of smaller box hangars are planned. To the north of these hangars are three rows of T-hangars.

A new development concept is planned to the west of the existing fuel farm. Several conventional hangars are situated at the building restriction line of Runway 17-35 with a large apron fronting these hangars. These hangars are ideally located adjacent to the primary runway, thereby reducing taxi times for pilots.

This concept represents a redevelopment of the property to the west of the terminal apron. The existing non-aviation related propane businesses would have to be re-

located. Various infrastructure improvements would have to be considered including storm water drainage and the surface road system.

In the existing hangar development area, the three T-hangar structures in the most need of immediate repair are instead replaced by eight box hangars. The concept is to replace aged and decrepit T-hangars on the west side of the taxilane with box hangars to reduce the total number of aircraft accessing the single taxilane, thereby reducing congestion.

The east area is all planned as new development. As with all the landside alternatives, the flightline along Taxiway A is considered for larger conventional hangars. In this case, three are planned. A taxilane is planned to the east of these hangars that would provide access to box hangars, then ultimately T-hangars.

LANDSIDE ALTERNATIVE D

Landside Alternative D, as shown on **Exhibit 4H**, considers the possibility of closing the west side of the WWII era hangar door. This resolves the issue of public vehicular traffic crossing an active taxilane to the hangar. The parking lot for the WWII era hangar can then be expanded, allowing the south side of the hangar to be more effectively used as the main entry point to the FBO offices. To the south of the WWII era hangar is a proposed terminal building that would serve as the landside entry point to the city.

A taxilane to the west of the WWII era hangar is extended north to provide access to a mix of hangar types. The east corner of the developable area is slightly different in this alternative than in Landside Alternative C. Here the main apron is expanded to the west, which would maintain the sightline from the WWII era hangar and terminal area to the primary runway. A series of conventional hangars are then lined up extending to the north along the building restriction line. This west side plan would require relocation of the propane companies.

The plan for the existing hangar development is to redevelop/replace the T-hangars that are in the most need for repair with box hangars. In this case, four T-hangar structures are planned to be replaced by box hangars. This would create a dedicated box hangar area.

The east side development plan in this alternative considers the addition of three to four conventional hangars facing a new apron. Set back from this area are four rows of T-hangars.

LANDSIDE SUMMARY

Landside facility layout should follow basic industry standards, such as locating high-activity hangars on or near the main terminal area apron. Medium-activity box or connected box hangars should then be set back from the flightline and low-activity T-hangars should be the farthest from the flightline. Sustainability in planning should also be considered by such means as maximizing available land area and limiting the need to extend utilities.

Each of the four landside alternatives follows these basic airport planning principles, primarily by planning future hangar development in the existing airport terminal area. This area is large enough to easily accommodate forecast growth in based aircraft at the airport. Each of the alternatives considers a long term vision that would extend beyond the 20-year

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Conventional Hangars
T-Hangars
T-Hangars
T-Hangars
Box Hangars
Box Hangars
Parking
Box Hangars
Box Hangars
Parking
Potential Terminal
Conventional Hangars
Conventional Hangars
Box Hangars
Box Hangars
Box Hangars
Box Hangars
Potential Terminal
Parking
Conventional Hangars
T-Hangars
T-Hangars
Box Hangar
Parking
Box Hangar
Parking
CORVALLIS
745'
35' BRL
Runway 17/35 5,900' x 150'
17
35
NORTH
0
300
600
SCALE IN FEET

LEGEND

- Airport Property Line
- Building Restriction Line (BRL)
- Future Airfield Pavement
- Future Buildings
- Future Parking/Roads
- Pavement to be Removed

CORVALLIS MUNICIPAL AIRPORT

Exhibit 4G
LANDSIDE ALTERNATIVE C

11MP12-4H-3/12/12

LEGEND

- Airport Property Line
- Building Restriction Line (BRL)
- Future Airfield Pavement
- Future Buildings
- Future Parking/Roads

0 300 600

SCALE IN FEET

NORTH

Conventional Hangars

T-Hangars

T-Hangars

T-Hangars

Box Hangars

Box Hangars

Parking

Box Hangars

Box Hangars

Box Hangars

Box Hangars

T-Hangars

T-Hangars

T-Hangars

T-Hangars

Parking

Permanently Close Door

Potential Terminal

Parking

Box Hangars

Conventional Hangars

Conventional Hangars

Conventional Hangar

Potential Terminal

CORVALLIS

17

745'

35' BRL

9

Runway 9/27 3,545' x 75'

27

CORVALLIS MUNICIPAL AIRPORT

Exhibit 4H
LANDSIDE ALTERNATIVE D

scope of the master plan. Only under some unpredictable circumstance, such as the need to accommodate a large influx of based aircraft to the field (e.g., another airport closes), would this full build-out be necessary within 20 years. Nonetheless, it is beneficial to provide a long term vision for the airport for future generations.

As discussed in Chapter Three – Facility Requirements, the airport is forecast to need approximately 29,400 square feet of new hangar space in the next five years and 83,400 over the next 20 years. An additional 14,200 square feet of space is estimated to be needed for maintenance activities and other non-storage needs. **Table 4A** presents a summary of the total hangar area proposed for each alternative.

TABLE 4A
Aircraft Storage Unit Summary
Corvallis Municipal Airport

	T-Hangar	Box Hangar	Conventional Hangar	Sub Total	T-hangar Removal	Total
Alternative A						
Square Feet	121,100	145,400	89,500	356,000	NA	356,000
Est. Storage Units	101	58	36	195	NA	195
Alternative B						
Square Feet	97,300	165,600	123,750	386,650	NA	386,650
Est. Storage Units	81	66	50	197	NA	197
Alternative C						
Square Feet	126,000	305,600	268,900	700,500	37,100	663,400
Est. Storage Units	105	122	108	335	34	301
Alternative D						
Square Feet	146,000	150,400	188,600	485,000	58,000	427,000
Est. Storage Units	122	60	75	257	45	212

Source: Coffman Associates estimates.

While the long term vision far exceeds the forecast need, the potential layouts presented allow hangar development to follow a phased approach for each hangar type. For example, if a T-hangar facility becomes the next priority, then it can be constructed immediately at the designated location with minimal extraneous costs.

ALTERNATIVES SUMMARY

Several development alternatives related to both the airside and the landside have been presented. On the airside, the major considerations are the potential to extend the runway an additional 600 feet, bringing the total runway length to 6,500 feet. This project should be considered a long term project that will be dependent upon a specific large business jet operating frequently. This specific justification will be needed to move forward with an extension.

Airside Alternative I considers placing the runway extension on the Runway 35 end. By extending to the south, the ILS approach to Runway 17 can be preserved by relocating and recalibrating only the localizer antenna. Airside Alternative II considers the extension on the north end, which would likely result in removal of the ILS and replacement with a CAT-I GPS

approach. The MALSR would have to be shifted to the north as well.

Runway 9-27 meets design standards currently. In Airside Alternative II, consideration is given to relocating the Runway 9 threshold 280 feet to the east in order to line up the threshold with Taxiway B. The minimum recommended runway length would be preserved and potential back-taxiing movements would be eliminated.

Four landside alternatives have been presented. The first is the result of efforts by a sub-committee of the PAC for the master plan. The second reflects some minor adjustments by the consultant. The third and fourth landside alternatives provide a longer term vision based on the disposition of the WWII era hangar. All four alternatives exceed the forecast hangar need, thereby providing a longer term vision than the 20-year scope of the master plan.

After review by the PAC, a recommended concept will be presented in the next chapter. Elements such as compliance with FAA standards and on-airport land use will also be addressed.